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PART II

SERPULIDICOLIDAE, A NEW FAMILY OF COPEPODA ASSOCIATED WITH TUBICOLOUS POLYCHAETES, WITH DESCRIPTIONS OF A NEW GENUS AND SPECIES FROM THE GULF OF MEXICO

By

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ABSTRACT

A new family of cyclopoid copepods is erected to contain the genera *Serpulidicola* Southward, *Rhabdopus* Southward, *Bactropus* Gravier (a preoccupied name), and *Rhynchopus* n. gen., all parasites of serpulid Polychaeta. The new genus contains a single new species, *R. catinatus*, parasitic on an undescribed species related to *Vermiliopsis*, collected from the eastern Gulf of Mexico.

INTRODUCTION

The parasites described in this paper belong to a group of families of poecilostome cyclopoid copepods showing gradually increasing reductions and adaptations to the parasitic mode of life. Within the group, or perhaps one can even speak of an evolutionary line, the Clausidiidae are the least modified, the Catiniidae and Clausiidae are much more modified, and the Nereicolidae are the most modified. Species of several genera in this group are known to parasitize different taxa of annelid worms.

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Females of the present parasites have fused urosomites as in the Nereicolidae, but also have, in contrast, a strongly developed fifth leg. Legs 1-4 are implanted lateroventrally and extend laterad, whereas legs are ventral and do not extend laterad in other families of the group. Other differences are simplicity of the mandibular morphology and lack of prehensile elements on the second female antenna. Also most noteworthy is the presence of pigmy males fixed to the female urosome. These characters are shared by a number of other genera, like the present species parasitic on serpulid worms. Although these serpulid parasite genera were tentatively assigned to the family Clausiidae by Southward (1964), I feel that the differences are so marked that a new family should be created for them.

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I thank Mr. T. H. Perkins, Florida Department of Natural Resources Marine Research Laboratory, who discovered the parasites described herein and sent them to me, and Dr. H. A. ten Hove, Zoölogisch Laboratorium der Rijksuniversiteit Utrecht, who identified the host species.

METHODS AND MATERIALS

Octocorals and serpulids with which these parasites were associated were collected during the Hourglass Cruises, a 28-month sampling program conducted on the central west Florida shelf off Tampa Bay and Sanibel Island by the Florida Department of Natural Resources Marine Research Laboratory, utilizing the R/V *Hernan Cortez*. Complete descriptions of stations, sampling gear, methods and collection data have been published by Joyce and Williams (1969). Specimens reported herein were collected only at Station E (Figure 1), 27°37'N, 84°13'W, in 73 m depth.

The specimens are deposited in the Zoölogisch Museum, Amsterdam (ZMA), the U.S. National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and the Invertebrate Reference Collection (prefix FSBC I), Florida Department of Natural Resources Marine Research Laboratory, St. Petersburg, Florida.

SYSTEMATICS

CLASS CRUSTACEA PENNANT, 1777
SUBCLASS COPEPODA LATREILLE, 1831
ORDER CYCLOPOIDA BÜRMEISTER, 1834

Serpulidicolidae, new family

Diagnosis: Poecilostome cyclopoid copepods of the clausidiid—clausiid—catiniid—nereicolid group. Female vermiform. Four pedigerous metasomites fused. Only 1 (genito-anal) or 2 (genital and anal) somites behind fifth pedigerous somite. First urosomite with large fifth legs extending posterolaterally. Male elongate cyclopiform, pigmy, fixed to ventral surface of female urosome. Strong sexual dimorphism in first and second antennae, second maxilla, maxilliped, all legs, and caudal rami. Second antenna not prehensile (female) or without prehensile claw-shaped elements (male). Mouthparts strongly reduced. Mandible styliform, with 1 or 2 stylets, but without auxiliary pieces. First maxilla minute. Second maxilla of female

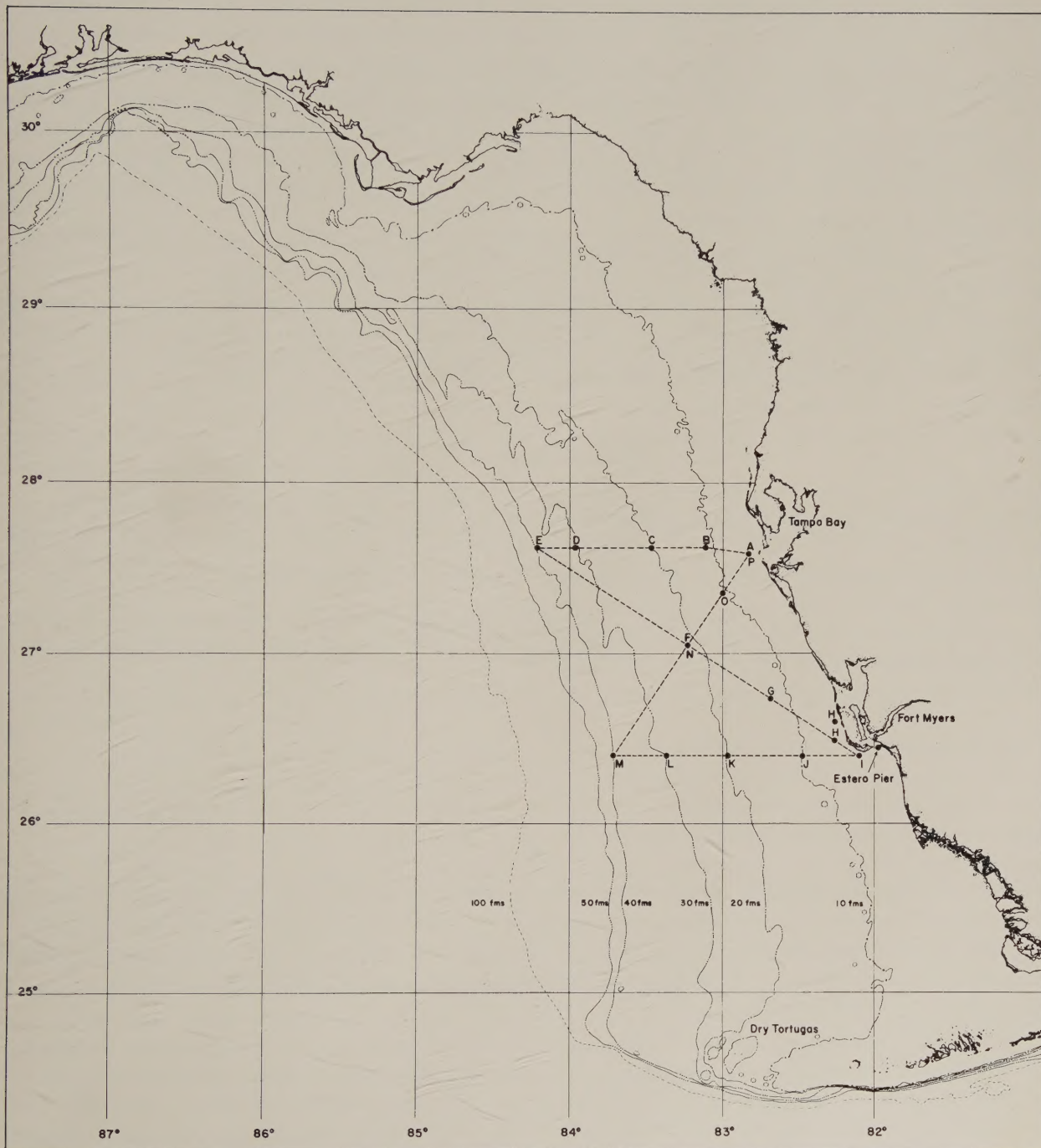


Figure 1. Hourglass cruise pattern and station locations.

not prehensile. Maxillipeds of both sexes prehensile. Legs 1-4 of female implanted lateroventrally, directed laterad; armature and segmentation reduced (endopodite lacking or strongly reduced); intercoxal plates all or partially lacking. Legs 1-4 of male ventral, biramous, well armed, well segmented, with intercoxal plates. Parasites of Serpulidae (tubicolous Polychaeta).

Type-genus: Serpulidicola Southward, 1964.

Remarks: Serpulidicolidae differs from other families in the group by a unique combination of characters: legs 1-4 of females are lateroventral instead of mid-ventral; enlarged fifth legs of females, possibly used for attachment inside the host's tube, are absent in Nereicolidae; number of abdominal somites of females is reduced to one or two, whereas in all other families except Nereicolidae, additional somites are present between genital and anal somites; antennal and mandibular armature is simple; and males are pigmy, fully cycloform, and attached to females.

Other genera assigned to Serpulidicolidae are *Rhabdopus* Southward, 1964, *Bactropus* Gravier, 1912 (a preoccupied name, possibly a synonym of *Rhabdopus*), and *Rhynchopus* new genus.

Species of *Entobius* Dogiel, 1908, resemble members of the Serpulidicolidae but lack prominent fifth legs and have biramous, unsegmented legs 1-4. The type-species of *Entobius* was found on a terebellid. Since the male of *Entobius* is unknown, its status must remain unsettled at the moment.

Rhynchopus, new genus

Diagnosis: Serpulidicolidae. Female similar to that in *Rhabdopus*, but first antenna 5-segmented and fifth leg bifid, unsegmented, much shorter than abdomen. Oral area enclosed by very strongly developed paragnaths and strongly developed, bicornous labrum, together forming sucker-like structure. Legs 1-4 without endopodite.

Male similar to that in *Serpulidicola*, except for basipodite with strong medial element and endopodite lacking medial armature on leg 1, endopodites of legs 1-3 3-segmented, and endopodite of leg 4 2-segmented.

Type-species: Rhynchopus catinatus n. sp.

Etymology: *Rhynchopus* (masculine), from the Greek *ρύνχος* (beak) and *πούς* (leg), alluding to the beak-like processes on the fifth leg of the female.

Remarks: Additional differences can be found in the number of segments of the first antenna of the female, structure of female maxillae 1 and 2, number of segments and shape of the female fifth leg, and details in armature and segmentation of male legs 1-4. The two segments apparently combined to form the basal segment of the first antenna of *Rhynchopus* are more distinct on *Serpulidicola* and *Rhabdopus*.

Rhynchopus catinatus, new species

Plate I, Figures 1-12; Plate II, Figures 13-23

Material examined: HOURGLASS STATION E: 1 ♀ (HOLOTYPE), 1 attached ♂ (ALLOTYPE); 2 August 1966; dredge; ZMA Co. 102.647. — 5 ♀, 2 ♂ (PARATYPES); same data; ZMA Co. 102.648-649. — 2 ♀ (PARATYPES); same data; USNM 172106. — 1 ♀ (PARATYPE); same data; FSBC I 20796. — 1 ♀ (PARATYPE); 3 March 1967; dredge; ZMA Co. 102.650.

Description: Female: Body vermiform (Plate I, Figure 1), length (rostrum to tips of caudal rami) 1.35-1.81 mm; greatest width of cephalosome 0.31-0.40 mm. Cephalosome well articulated with unsegmented metasome. Somite carrying fifth leg (= first urosomite) articulated with metasome and with genito-anal somite (Plate I, Figure 2). Ovisacs sausage-shaped, multiseriate, in some specimens longer than body; eggs elliptical, 100-160 μm in diameter.

First antenna (Plate I, Figure 3) 5-segmented. Elongate basal segment apparently originally composed of 2 fused segments; distal 4 segments rectangular to nearly square. Segment 1 with 4 normal, naked setae, 1 reversed seta, 1 spine-like element; segment 2 with spine-like element; segment 3 with 1 long and 1 minute seta; segment 4 with 2 long setae; segment 5 with 2 long terminal and 4 shorter subterminal setae. Bases of first antennae separated by 3-lobed rostrum (Plate I, Figures 1, 3).

Second antenna short, 3-segmented (Plate I, Figure 4), forming frontal limit of oral area (Plate I, Figure 5). Segment 1 elongate, unarmed; segment 2 short, armed with 1 hyaline spine; segment 3 elongate, armed with 1 lateral hyaline spine and 3 short distal elements.

Sucker-like oral area (Plate I, Figure 5) enclosed laterally by 2 curved, chitinous structures, provisionally called "paragnaths" (Plate I, Figure 6), medially and ventrally armed with numerous rows of squamose hairs; posteriorly bearing single hyaline, spiniform process. Labrum large, protruding between bases of second antennae, posterolateral corners produced into horn-like processes partly covering sickle-shaped, single bladed mandibles (Plate I, Figures 5, 7). Mandible tips pointing to oral aperture; latter surrounded by sclerotized frame. Two very small (vestigial) mouthparts superimposed behind mandibles, composed of small, narrow lobe with 1 setule (presumably, first maxilla) and larger, 2-segmented appendage consisting of heavy basal segment and unarmed claw (presumably, second maxilla). U-shaped, sclerotized rim (probably labium) enclosing posterior oral area.

Pair of prehensile appendages well posteriad of oral region, no doubt homologous with maxillipeds (Plate I, Figure 8), consisting of 2 unarmed segments and median claw with small auxiliary hook near its insertion.

Legs 1-4 without intercoxal plate. Leg 1 (Plate I, Figure 9) with 2-segmented protopodite, consisting of coxopodite bearing lateral field of spinules and unarmed basipodite; exopodite (the only ramus; see *Remarks*) of 3 segments; segments 1 and 2 each with lateroterminal, spinuliferous, pointed process; segment 3 with 2 such processes, 1 medioterminal seta, and 2 medial setules. Legs 2-4 very similar to leg 1, but lacking medial setules on exopodite segment 3; terminal seta of segment 3 longest on leg 1, gradually shorter on following legs (Plate I, Figures 10, 11).

Leg 5 (Plate I, Figure 12) unsegmented; medial, tapering projection armed with field of spinules and 1 short seta; longer, lateral extension with lateral swelling, 2 lateroterminal setules and 2 medioterminal, beak-like processes.

Genital somite fused with anal somite (Plate I, Figure 2); genito-anal complex slightly wider than long (171 x 199 μm), ovaria discharging near widest point. Lateral, simple spine and medial, foliate spine presumably representing rudiments of sixth leg. Anus between 2 swellings of posterior margin of somite.

Caudal rami (Plate I, Figure 2) 69 μm long, 22 μm wide at 60% of length; ramus slightly curved inward and slightly tapered, bearing 1 lateral seta near middle of lateral margin, 1 shorter, subterminal lateral seta, 2 almost spiniform distal setae, 1 subterminal medial seta, and 1 dorsal seta.

Male: Fully cycloform, slender (Plate II, Figure 13). Pigmy; length (rostrum to tips of caudal rami, but without caudal setae) 0.56 mm; greatest width of cephalosome 0.14 mm; attached to ventral surface of female urosome, with cephalosome pressed against fifth pedigerous somite of female (Plate I, Figure 1). First pedigerous somite free, well articulated, not included in cephalosome. Urosome of 6 somites, consisting of fifth pedigerous somite, genital somite, 3 abdominal somites, and anal somite (Plate II, Figure 14).

TABLE 1. CHAETOTAXIS OF LEGS 1-4 OF MALE *Rhynchopus catinatus*.

	Leg 1	Legs 2, 3	Leg 4
Protopodite	0-0; 0-I	0-0; 1-0	0-0; 0-0
Exopodite	I-0; I-0; II-I-3	I-0; I-1; II-I-5	I-0; I-1; II-I-5
Endopodite	0-0; 0-0; 3	0-1; 0-0; I-2	0-1; I-2

First antenna (Plate II, Figure 15) 7-segmented; segments bearing 2, 4, 1, 4, 3, 3 and 5 setae, respectively; segment 7 also with 1 aesthete. Triangular rostrum separating bases of first antennae.

Second antenna (Plate II, Figure 16) 4-segmented; segments 1 and 2 elongate, unarmed; segment 3 elongate, distally armed with 1 short and 2 long setae; segment 4 knob-like, armed with 2 terminal setae.

Oral area (Plate II, Figure 17) without paragnaths. Labrum pronounced, with mediocaudal, lobate projection. Mandible covered by labrum, stylet-shaped, simple. First maxilla as in female, but not covered by second maxilla. Second maxilla inserted well behind labium, consisting of unarmed basal segment and bicuspid distal segment; inner cusp bearing setule.

Maxilliped large, strongly prehensile (Plate II, Figure 18); basal segment triangular, unarmed; second segment medially produced into reversed lobe, medial surface rugose; third segment rectangular, small, unarmed; fourth segment claw-like, curved, distally crenulate, with subbasal setule.

Legs 1-5 each with intercoxal plate, those of legs 1-4 trapezoidal, wide; that of leg 5 U-shaped, narrow. Legs 1-3 (Plate II, Figures 19, 20) with 3-segmented endopodites and 3-segmented exopodites. Legs 2 and 3 similar in shape and armature. Leg 4 (Plate II, Figure 21) with 2-segmented endopodite and 3-segmented exopodite. Exopodites longer, stronger, more elaborately armed than endopodites. Chaetotaxis of legs 1-4 as in Table 1.

Leg 5 (Plate II, Figure 22) 2-segmented; segment 1 nearly square, armed with 1 lateral seta; segment 2 narrow at base, wider distally, armed with 1 lateroterminal and 2 terminal, foliate spines.

Genital somite (Plate II, Figure 14) rectangular, longer than wide, with triangular genital lobes, each armed with 2 short setae.

Caudal rami (Plate II, Figures 14, 23) 35 x 12 μ m; ramus armed with 1 lateral seta slightly anterior to middle of ramus, 1 dorsal seta, 1 lateroterminal foliate spine, 2 naked, terminal setae, and 1 medioterminal spine.

Type-locality: Hourglass Station E, 27°37'N, 84°13'W, 73 m depth; about 78 nmi due west of Egmont Key, Florida west coast.

Host: Parasitic in tubes of an undescribed species of serpulid polychaete, apparently related to the genus *Vermiliopsis*, fixed on a paramuriceid gorgonian, *Bebryce cinerea* Deichmann, 1936.

Distribution: Known only from the type-locality in the Gulf of Mexico.

Etymology: From Latin, *catinatus* (bearing a sucker), alluding to the sucker-like oral area of the female.

Remarks: Gravier (1913) supposed the well-developed rami of legs 1-4 in females of *Bactropus* to be endopodites, but in female *Rhynchopus catinatus*, the implantation of the single ramus present on the basipodite seems to indicate that this well-developed ramus is homologous with the exopodite. Southward (1964) also considered the longer rami in female *Rhabdopus* and *Serpulidicola* as exopodites. In males of *Rhynchopus* and *Serpulidicola*, exopodites of legs 1-4 are fully developed, whereas endopodites are reduced.

There can be little doubt that females of *Rhynchopus catinatus* show strong resemblance to those of *Serpulidicola* and *Rhabdopus*. The male of *Rhabdopus* is unknown; males of *Rhynchopus* and of *Serpulidicola* have many traits in common. The main reason for treating *Rhynchopus* as a different genus is the rather different organization of the oral area. In female *Rhynchopus*, the predominating structures in the oral area are the paragnaths, apparently absent in *Serpulidicola* and *Rhabdopus*. In male *Serpulidicola*, a labrum seems to be absent or at least not prominent; in *Rhynchopus*, it is strongly developed.

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PLATE I

Rhynchopus catinatus, n. gen., n. sp., ♀

- Figure 1. Body, holotype, ventral aspect, with ovisac and with allotype male attached to urosome; scale AB.
- Figure 2. Genito-anal somite, ventral aspect; scale AD.
- Figure 3. First antenna and rostrum (=r); scale AE.
- Figure 4. Second antenna; scale FG.
- Figure 5. Oral area, ventral aspect; a2 = second antenna; l.i. = labium; l.s. = labrum; o.a. = oral aperture; md = mandible; mx1 = first maxilla; mx2 = second maxilla; p = paragnath; scale FG.
- Figure 6. Paragnath; scale FG.
- Figure 7. Mandible; scale FG.
- Figure 8. Maxilliped; scale FG.
- Figure 9. First leg; scale AE.
- Figure 10. Distal endopodite segment of third leg; scale AE.
- Figure 11. Distal endopodite segment of fourth leg; scale AE.
- Figure 12. Fifth leg; scale AD.

Scales AB through AE each 100 μm ; scale FG 50 μm .
Figure 1 ZMA Co. 102.647; Figures 2-12 all ZMA Co. 102.649.

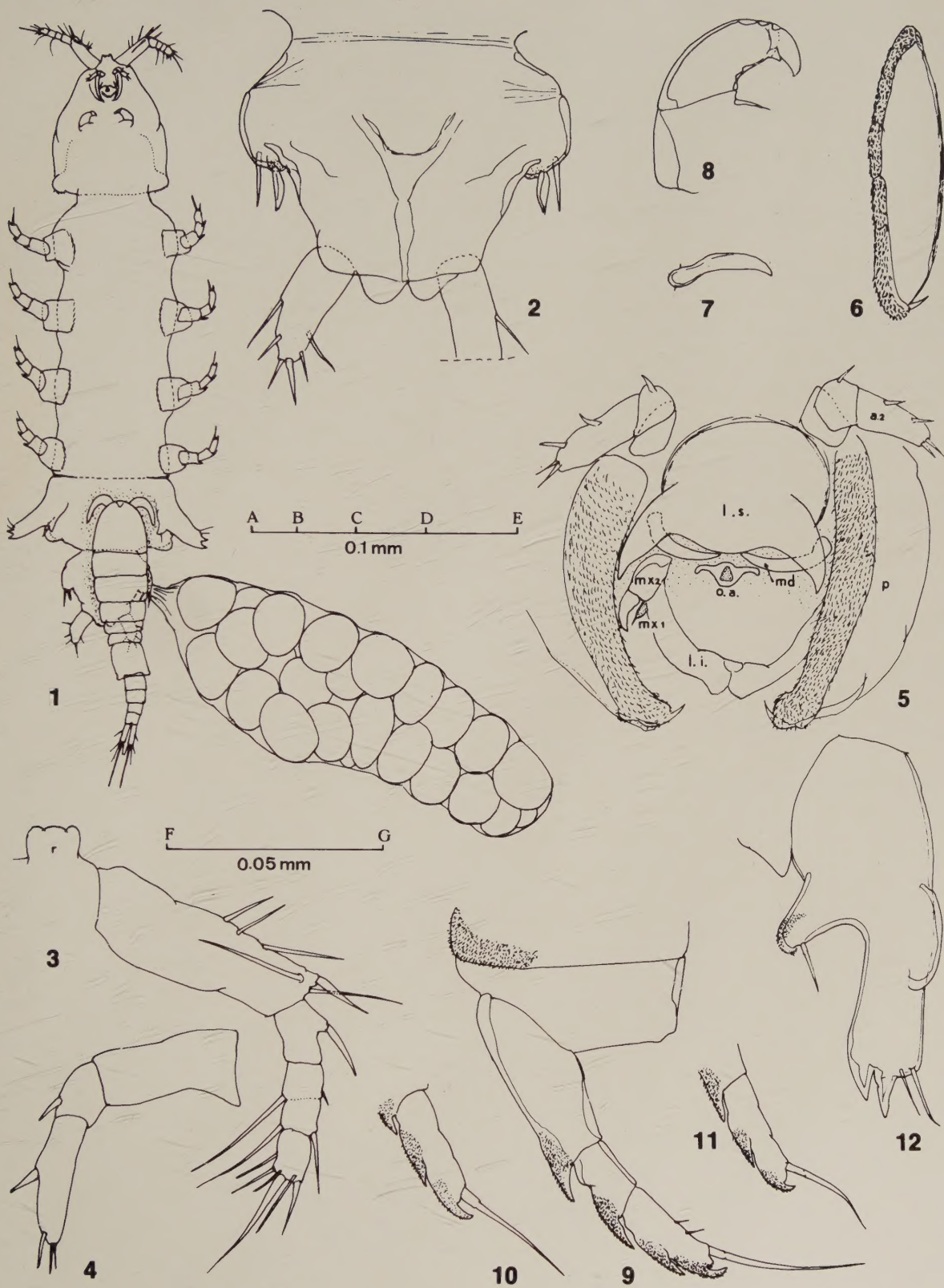


PLATE II

Rhynchopus catinatus, n. gen., n. sp., ♂

Figure 13. Body, ventral aspect; scale AC.

Figure 14. Urosome, ventral aspect; scale AD.

Figure 15. First antenna and rostrum (=r); scale FG.

Figure 16. Second antenna; scale FG.

Figure 17. Oral area, ventral aspect; mxp = maxilliped; other abbreviations as in Plate I; scale FG.

Figure 18. Maxilliped; scale FG.

Figure 19. First leg; scale FG.

Figure 20. Third leg; scale AE.

Figure 21. Fourth Leg; scale AE.

Figure 22. Fifth leg; scale FG.

Figure 23. Caudal ramus, ventral aspect; scale FG.

Scales as in Plate I.

Figures 13-23 all ZMA Co. 102.649.

